Note on Dr. N. de Konkoly's Remarks on Mr. Hilger's Illumination of Micrometers with Vacuum Tubes. By Rev. S. J. Perry, F.R.S.

The adverse criticism of Dr. Konkoly appears to arise from a mistake. The micrometer exhibited at the meeting of this Society differs entirely in the method of illumination from the instrument at the Observatory of Kalocsa. The latter was constructed in 1880, and has a side illumination, whereas the curved vacuum tube in the Vizagapatam micrometer is placed inside the micrometer, and gives uniform illumination of the whole system of webs.

The whole of the Equatorial, including micrometer and circles, may be most conveniently illuminated by a couple of bichromate cells, with wires that may be attached as required to fixed vacuum tubes. Such a system of illumination has been in use for some time at one of the private observatories of Lancashire, and is found to answer perfectly. That Dr. de Konkoly can obtain equally satisfactory results with a number of small Swan lamps is a matter of congratulation.

Stonyhurst Observatory:
1884 *May* 7.

The Orbit of Pons' Comet. By J. Morrison, M.A., M.D., Assistant on the American *Ephemeris and Nautical Almanac*, Washington, D.C.

The only orbits of this comet which have been published are those of the late Prof. Encke and of Messrs. Schulhof and Bossert: the former deduced from observations extending over a period of only two months in the year 1812, and the latter from observations made in 1883, and subsequently corrected two or three times by equations of condition. Neither Encke's orbit nor that of Schulhof and Bossert represents the motion of the comet with that degree of accuracy which modern investigations demand. In order to obtain an independent determination of the elements, I select the three following observations made at Washington:—

Washington M.T.	Apparent α	Apparent δ
1883 Oct. 10·307425	248° 25′ 56″·1	+56° 51′ 49″·0
Dec. 27·249330	317 34 50·4	+29 31 14·8
1884 Jan. 21·299233	357 36 1·5	−13 31 23·1

The comparison stars were respectively, a *Berliner Jahrbuch*

star; ζ *Cygni*; and a 7th-magnitude star in *Cetus*, as given in the Catalogues of Weisse, Lamont, and Stone.

From these observations I obtain the following system of elements:—

T	... ...	1884 Jan. 25·729107, G.M.T.
ω	... ...	199° 12′ 50″·48 } Mean Equinox
Ω	... ...	254 9 45·82 } of 1884·0.
i	... ...	74 2 0·73
e	... ...	·95414506
log q	... ...	9·8896779
log a	... ...	1·2282918
P	69·572 years.	Motion Direct.

The residuals for the middle place are zero. It will be noticed that these elements differ considerably from those of Encke and Messrs. Schulhof and Bossert. The following residuals show how closely this system of elements satisfies the observations made from Sept. 5, 1883, to Feb. 5, 1884:

Date. Washington M.T.		C−O $\cos\beta\, d\lambda$	C−O $d\beta$	log Δ	Observation made at
		″	″		
1883 Sept.	5·11 +	− 3·57	−3·72	0·3668189	Milan.
	23·32 +	− 3·65	−5·09	0·3282883	Washington.
Oct.	31·29 +	− 6·14	−6·59	0·2103271	,,
Nov.	1·33 +	+ 3·73	−6·90	0·2060407	,,
	27·29 +	+ 4·82	+7·90	0·0707879	,,
Dec.	6·25 +	+10·03	−1·18	0·0093336	,,
	21·24 +	+10·60	−7·20	9·8932833	,,
1884 Jan.	3·23 +	− 3·12	−2·29	9·8126678	,,
	9·30 +	− 0·26	−1·48	9·8023359	,,
	17·30 +	− 0·82	−4·30	9·8246773	,,
	25·29 +	− 1·12	+1·10	9·8749017	,,
Feb.	1·28 +	+ 1·78	+0·14	9·9258903	,,
	5·01 +	− 2·74	+1·23	9·9522952	Rome.

Owing to errors in the adopted position of the comparison stars, many of which have not been very accurately determined, and also to the uncertainty always existing in observations of comets in consequence of the ever varying form of the nucleus, these residuals are less than what we may reasonably expect to arise from these causes alone, not to mention the unavoidable errors of computation, even when seven-figure tables are employed, as in the present instance. The formation of equations

of condition for the purpose of correcting these elements, cannot be here applied with any advantage.

The only planets which can have any appreciable influence on the motion of the comet during the time it was in the neighbourhood of perihelion are *Venus* and the Earth. Assuming the elements I have obtained above as the osculating elements for the epoch Jan. 26·0, Greenwich Mean Time, the perturbations of the rectangular co-ordinates, arising from the action of *Venus*, are found to be as follows :—

Greenwich M.T.	δx	δy	δz
1884 Jan. 26·0	−0·0	− 0·0	+0·0
31·0	−0·1	− 0·3	+0·1
Feb. 5·0	−0·2	− 1·0	+0·4
10·0	−0·4	− 2·0	+0·9
15·0	−0·6	− 3·2	+1·7
20·0	−0·9	− 4·7	+2·6
25·0	−1·3	− 6·5	+3·8
Mar. 1·0	−1·7	− 8·5	+5·0
6·0	−2·1	−10·8	+6·5
11·0	−2·6	−13·5	+8·0

which are expressed in units of the *seventh* decimal place. These perturbations do not sensibly affect the inclination, and their influence on the node is less than a second of arc ; they are then almost inappreciable, and, indeed, they scarcely exceed the uncertainty of the seventh decimal place in the final results of extended computations such as the one now under consideration. The perturbations of the rectangular co-ordinates arising from the action of the Earth are even less than those produced by *Venus*, by reason of the Earth being at a greater distance from the comet.

According to my elements, the aphelion distance is 33·056, which exceeds *Neptune's* mean distance from the Sun by about *three* mean radii of the Earth's orbit, and although the inclination is large (74° 2′), the comet will nevertheless be sensibly affected by the action of all the superior planets during the greater part of its period. The amount of this action during the last revolution may, perhaps, be approximately found by comparing my elements with those of Encke, as given in the *Annales de l'Observatoire de Bruxelles*, tom. 1. If we refer Encke's elements to the mean equinox and ecliptic of 1884·0, and place them beside mine in order to facilitate comparison, we have the following results :—

	Morrison.	Encke.
T*	1884 Jan. 25·72917	1812, Sept. 15·313553
ω	199° 12′ 50″·48	199° 17′ 5″·89
Ω	254 9 45·82	254 1 28·91
i	74 2 0·73	73 56 57·41
e	0·95414506	0·9545412
log q	9·8896779	9·8904995
P	69·572 years	70·684 years

Assuming these values of T to be correct, the actual period of the last revolution was 71·3605 years, and therefore Encke's period has been increased by 247·09 days. It is very probable, however, that Encke's elements are considerably in error, for Messrs. Schulhof and Bossert have deduced from the original observations of 1812 the following elements, which agree tolerably well with mine :—

$\pi - \Omega = \omega$	199° 12′ 32″·5	Mean Equinox, 1880·0
Ω	254 6 15·3	
i	74 3 20·4	
e	0·9549960	
log q	9·8893650	

If we add 3′ 20″·92, or four years' precession, to Ω, we get 254° 9′ 36″·2, which is almost identical with my value, while the values of ω and i will not be sensibly affected by this change.

* Greenwich Mean Time.

Sextant Observations of Comet Pons-Brooks, as seen from the ship "Superb," Jan. and Feb. 1884. By Capt. D. W. Barker.

(*Communicated by Capt. H. Toynbee.*)

Date.	Lat. S.	Long. W.	Bar.	Alt. Ther.	Air Ther.	Corr. Chron. Time G.M.T.	∗ from which Dist. of Comet's Nucleus was measured.	Dist. of Nucleus from star.	Remarks.
1884.	° ′	° ′				d h m s		° ′ ″	
Jan. 15	26 27	127 40	30·173	82	77	15 17 1 32	Achernar	60 27 22	Bright, well defined nucleus, with short and faint tail pointing in a N. direction; about $2\frac{1}{2}^{\circ}$ long.
						3 52	α Tauri	78 58 47	
						5 25	β Ceti	24 21 2	
16	27 43	126 9	30·217	83	77	16 16 44 28	Achernar	58 4 17	Tail faint; nucleus round, bright in centre, and envelope visible all round.
						46 29	α Tauri	78 5 47	
						47 48	β Ceti	22 4 7	
28	48 48	97 33	29·800	59	49·4	28 15 53 27	Achernar	36 31 39	Intrinsic brightness of nucleus about the same as α Sculptoris
						15 58 10	Aldebaran	72 38 4	
						16 1 29	β Ceti	6 30 19	
						16 3 48	θ Eridani	36 11 44	
30	50 57	90 14	29·982	59	47	30 15 24 44	Achernar	33 49 14	
						27 9	Canopus	68 48 24	
						30 5	Rigel	68 44 9	
Not visible again till Feb. 16 on account of cloudy weather.									
Feb. 16	37 45	36 58	30·045	64	58	16 11 0 39	Achernar	17 33 59	Much fainter, and tail not distinguishable at all to naked eye.
						3 33	θ Eridani	19 5 19	
						7 5	α Tauri	72 7 34	

After Feb. 16 it became too faint for sextant observation. The chronometer time is corrected for rate, and the distances for index error of sextant.